



## Release Notes

### MC58xx0 version 3.1

<b>Document last updated:</b>	9/6/2013	
<b>Product names:</b>	MC58420, MC58320, MC58220, MC58120, MC58110	
<b>Date of build:</b>	8/23/2013	
<b>Device Checksum:</b>	58110031	0xFD5DB2FD
	58120031	0xFD14FAC6
	58220031	0xFCFC7734
	58320031	0xFCE2C48D
	58420031	0xFCC9151E

**Compatible IO devices:** MC50000IOAD8

#### **Description:**

The MC58xx0 are motion control processors for servo and stepper motors and provide one to four axes of motion. This document details bug fixes and changes for this release.

This release supports the Atlas “rescue” mode, as described in section 4.9.1.3 of the Atlas Complete Technical Reference. This mode is intended to restore Atlas drives that have been configured for pulse and direction input to a state where they are programmable using SPI. The rescue mode is entered by using SetOutputMode 9, this mode is available only for motor type 4, full step. When using the rescue mode a single Atlas should be connected to Magellan using the usual SPI connections. After powering on the Atlas and waiting 250  $\mu$ s the output mode may be changed to 6, Atlas SPI, and SPI commands may be sent.

The Atlas will be in flash mode, as it would be after the DriveFlash 0 0 command. In this mode the user-programmable non-volatile RAM may be cleared, restoring the Atlas to SPI operation.

Multiple (powered) Atlases must not be connected to Magellan when using the rescue mode. Any Magellan axes using Atlas SPI or SPI DAC output mode will have communication disabled if the rescue mode is entered. Changing the output mode of any axis to Atlas SPI or SPI DAC while using the rescue mode will cause it to malfunction.

This release includes support for 32 bit parallel encoders. The encoder data will be read on the parallel bus as two separate 16-bit words, high word first. *It is the responsibility of the hardware providing encoder data to ensure that the high and low words are consistent.* The low word is read immediately after the high word, within 200 ns.

32 bit parallel encoder addresses are as follows:

Axis 1	high	0x810
	low	0x811
Axis 2	high	0x812

	low	0x813
Axis 3	high	0x814
	low	0x815
Axis 4	high	0x816
	low	0x817

The maximum supported change in encoder reading is 32767 (positive or negative) in a single commutation period of 102  $\mu$ s.

#### **Known Bugs:**

90177	Sending SetMotorCommand 0 immediately after InitializePhase may prevent motor from moving. To avoid this problem do not issue a SetMotorCommand after InitializePhase until the activity status register indicates that initialization is complete.
350	When using both the CAN and serial interfaces simultaneously to communicate with Magellan, some Atlas trace values are incorrectly read as zero.

#### **Known Issues:**

MC58x20 only: If the IO chip HostRdy signal (pin 8) is used for chip busy detection, the first instruction sent to the chipset after a device reset may be ignored or may produce a checksum error. It is recommended that in this configuration a NoOperation command be sent to the chipset as the first instruction after a power on or reset. If the ReadStatus operation is used to check the HostRdy state this problem does not occur.
The position loop integral contribution trace variable always traces as zero.
When using the parallel communication channel it is possible to send enough commands to Magellan to interfere with profile calculation, resulting in trajectory errors. It is recommended to delay sending commands so that at least 500 microseconds is allowed for each.
The Magellan Motion Processor Programmer's Command Reference has not been updated to reflect changes made for Atlas support. The changes are documented in these release notes, the Magellan Motion Processor User's Guide, the Magellan Motion Processor Developer's Kit Manual, the Magellan Motion Processor MC58000 Electrical Specification, the Atlas Digital Amplifier User's Manual, and the Atlas Digital Amplifier Complete Technical Reference.

#### **Command Changes:**

SetOutputMode	For motor type 4 only, the argument 9 is defined as Atlas rescue mode, see notes above.
SetEncoderSource	Now accepts an argument of 6 to denote "32 bit parallel".
SetTraceVariable	Trace variable 83 has been added: actual velocity in 32.0 format. Trace variable 6, actual velocity in 16.16 format, is still supported.
SetTraceVariable	Trace variable 84 has been added: raw parallel encoder reading. This value will differ from the actual position if SetActualPosition or AdjustActualPosition has been used.

**Incompatibilities with previous version:**

The behavior of the Activity status positive limit and negative limit bits is changed. In previous versions these bits were set only when the corresponding limit event was raised, and cleared only when the corresponding limit signal became inactive. This behavior was not well documented, and led to problems such as bugs 235 and 337, below.

In the current release, the Activity status limit bits are set if the corresponding limit signal is active and there is a nonzero event action for the corresponding limit event.

**Changes/Fixes:**

163	The SetOutputMode command accepted argument values of 3 (SPI offset binary) and 5 (SPI 2s complement) with a motor type of two phase BLDC or two phase microstep. Neither mode is actually supported. In these cases the command now returns an invalid argument error code.
179	In some cases, when the negative limit switch was active, a negative limit event was raised when moving in a positive direction using the s-curve profile. This is fixed.
232	When the stop and clear position error breakpoint action was configured nothing was actually done when the breakpoint triggered. This feature now works.
330	The limit switches were ignored when the profile generator was not enabled, contrary to the documentation, which says that the sign of the motor command should determine whether to raise a limit event. This feature is now implemented as described.
333	For step motors, the AdjustActualPosition command sometimes caused a jump in the motor phase angle, and a consequent jump in the physical rotor position. This bug is fixed.
334	When in Atlas output mode, in some cases the SetOperatingMode command would fail to correctly set the profile generation bit in the Magellan operating mode register. This bug is fixed.
335	An update causing a move in the direction of a tripped limit switch did not result in the "invalid move into limit" error unless a limit event had previously been raised. Limit error checking is now correctly done.
337	Setting the limit event action to zero would not prevent an "invalid move into limit" update error if a limit event had previously been raised. Limit error checking is now correctly done.
339	When the OutputMode0 pin was grounded and Magellan reset, the motor on Activity status bit was set after reset even though the operating mode was 1 (output disabled). OutputMode0 is used to select an Atlas-compatible set of reset defaults. This bug is fixed.
345	In some cases the commanded acceleration trace in trapezoidal profile mode showed some small but spurious oscillations. This

	is fixed by properly rounding the internal value.
347	The default output mode for the two phase microstep motor type, with the OutputMode0 pin grounded, was Atlas, which is not in fact supported. The default mode is now (backwards compatible) signed magnitude PWM.
348	In some cases when multiple Atlases were power cycled simultaneously Magellan did not successfully reconnect with all of them. This bug is fixed.

## Version 3.0:

### **Known Bugs:**

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### **Known Issues:**

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The position loop integral contribution trace variable always traces as zero.
When using the parallel communication channel it is possible to send enough commands to Magellan to interfere with profile calculation, resulting in trajectory errors. It is recommended to delay sending commands so that at least 500 microseconds is allowed for each.
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### **Pinout Changes:**

pin 7, OutputMode0	This pin, formerly designated NC, is now used to enable non-backwards compatible changes in behavior required for Atlas support. If this pin is grounded when Magellan comes out of reset the new mode will be selected; if it is not connected then a backwards-compatible mode will be selected.
pin 33, AxisOut1	This pin, formerly designated NC, now always carries the Axis 1 AxisOut signal.
pin 32 SPIRcv/AxisOut1	This pin, formerly designated AxisOut1, is now used for SPI data input from Atlas amplifiers, but only if the OutputMode0 pin is grounded. In the backwards-compatible mode it

	continues to work as before.
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**Command Changes:**

***Unless otherwise noted these changes apply only when the OutputMode0 pin is grounded.***

Set/GetOutputMode	Two new output modes are defined: output mode 6 is used for Atlas, and is the default output mode for motor types 0 (BLDC), 4 (Step), and 7 (brush DC). For step motors mode 8 now denotes pulse & direction. (Pulse & direction was formerly the only option for this motor type).
Reset	The default operating mode is now 1 (output disabled).
Set/GetSignalSense	For motor types with Atlas output the StepOutput signal sense bit (bit 11) controls the sense of the axis SPIEnable signal. For Atlas output this is set (active low) by default.
GetTraceValue	This command, opcode 40 (0x28), accepts a single 16-bit argument denoting a trace variable, and returns a 32-bit value corresponding to the current value of that variable for the addressed axis. This command is available regardless of the OutputMode0 state.
ResetEventStatus	This command is now relayed to Atlas.
SetOperatingMode RestoreOperatingMode	This command is now relayed to Atlas.
SetEventAction, GetEventStatus, ResetEventStatus	<p>This command may now be used to specify the current foldback action (event 4). For that event it is relayed to Atlas, which may disable output. Magellan may be configured to perform any of the usual event actions.</p> <p>Event bit 11 is now defined as “Drive Exception”, meaning that Atlas has encountered a condition requiring it to disable output. In response, Magellan will always disable output as well. Consult Atlas documentation for more information.</p> <p>Event 7, Instruction Error, is now overloaded to indicate an Atlas SPI checksum error. In case of an Atlas checksum error bit 14 of the Drive Fault Status register will be set.</p>
Set/GetCurrent	This is a new name for Set/GetHoldingCurrent, opcodes (94/95), and is backwards compatible but now takes a third parameter value, 2, to specify the normal output current used when a step motor is moving. In that case the command is relayed to Atlas.
GetPhaseCommand	This command is now relayed to Atlas.

Set/GetPhaseCounts	For step motors, this command is now relayed to Atlas.
Set/GetPWMFrequency	This command is now relayed to Atlas.
DriveNVRAM	Opcode 48, is now used to erase or program user initialization memory on Atlas. See Atlas documentation for more information.
GetDriveFaultStatus	Opcode 109, is now used to retrieve Atlas fault status. In addition to the bits documented for Atlas, bit 14 of this register indicates that an SPI checksum error was detected when communicating with Atlas, and bit 15 indicates that the Magellan motor type is not compatible with the (fixed) Atlas motor type.
ClearDriveFaultStatus	Opcode 108, is used to clear all drive fault status bits, on both Magellan and Atlas.
GetDriveStatus	<p>Now includes several Atlas-related bits. These are updated periodically when sending torque commands to Atlas, so GetDriveStatus command timing is not affected. Consult the Atlas documentation for more information.</p> <p>           Bit 1: current foldback            Bit 2: overtemperature            Bit 5: overvoltage            Bit 6: undervoltage            Bit 12: drive output clipped            Bit 15: Atlas not responding         </p>
Update	Now signals Atlas to update it's own buffered parameters by setting a bit in the next torque command. (No command timing penalty).
SetUpdateMask, SetBreakpointUpdateMask	Now allow bit 8 to be set to trigger Atlas updates. This bit is set by default.
Set/GetTraceMode	Now accepts an additional bit (3) to indicate the mode used for the trace bit sent to Atlas as part of each torque command. When clear this bit indicates "internal trigger", meaning the SPI trace bit will be set as long as Magellan trace is running. When set this bit indicates "external trigger", meaning that the SPI trace bit will be set only when Magellan is actually collecting a trace sample, allowing Atlas to synchronize trace sampling with Magellan.
SetTraceStart, SetTraceStop	These commands now also control an SPI command bit in each Atlas torque command, allowing Magellan to control Atlas trace. (No command timing penalty).
SetSampleTime	The minimum sample time for single axis Magellan products is raised to 102 microseconds when using the Atlas output mode. There is no new restriction when not using Atlas, but the sample time may have to be set after changing output mode.

**Command Changes:**

**The following commands are relayed directly to Atlas. Consult Atlas documentation for details.**

opcode	name
67/66	Set/GetCurrentControlMode
35/36	Set/GetDrivePWM
64	GetBusVoltage
65/66	SetCurrentFoldback
83	GetTemperature
90	GetFOCValue
96/98	GetDriveFaultParameter
113	GetCurrentLoopValue
115/116	Set/GetCurrentLoop
246/247	Set/GetFOC
126/127	Set/GetDriveCommandMode

**Bug Fixes:**

309	After a trace trigger the start of tracing was delayed by the trace period. In the current release tracing begins immediately.
125	Actual position breakpoints sometimes triggered incorrectly when the actual position was near the wrap around value, this is fixed.
153	When in “actual position” motion complete mode the motion complete event was raised each time an axis transitioned from unsettled to settled, even without a new move. In the current release motion complete is signaled only once per move.
157	The AdjustActualPosition command sometimes corrupted the actual position, this is now fixed.
274	When the SetOutputMode command was called with an illegal argument the Magellan processor could be left in an inconsistent state where GetOutputMode returned the illegal value, but the corresponding output was not performed. SetOutputMode now restores all state after signaling an illegal argument.
176	A reset command using multi-drop serial communications could result in a spurious checksum error. This is fixed.
330	Limit events were not signaled unless the operating mode profile bit was set, contrary to the documentation, which states that in that case limit events should be raised using the current motor command to determine the direction of motion. This is fixed.
329	Under certain circumstances pulse and direction step output was, rarely, incorrect. This is fixed.
186	For step motors with actual position units of steps parallel encoder input did not work correctly. This is fixed.

**Incompatibilities with previous version:**

Trace start timing is changed, see bug 309.
Limit events may be signaled when the profile generator is not enabled, see

bug 330.
Motion complete events are no longer signaled multiple times in “actual position” complete mode, see bug 153.
When OutputMode0 is grounded, the default operating mode for all motor types is 1.
When OutputMode0 is grounded the default output mode where applicable is 6 (Atlas).
When OutputMode0 is grounded, pulse & direction output must be selected by using SetOutputMode 8.
When OutputMode0 is grounded, the SPIEnable pins are configured to be active low by default.
Command timing is changed for all commands that must be relayed to Atlas.

## Version 2.4:

### **Known Bugs:**

90177	Sending SetMotorCommand 0 immediately after InitializePhase may prevent motor from moving. To avoid this problem do not issue a SetMotorCommand after InitializePhase until the activity status register indicates that initialization is complete.
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### **Known Issues:**

MC58x20 only: If the IO chip HostRdy signal (pin 8) is used for chip busy detection, the first instruction sent to the chipset after a device reset may be ignored or may produce a checksum error. It is recommended that in this configuration a NoOperation command be sent to the chipset as the first instruction after a power on or reset. If the <i>ReadStatus</i> operation is used to check the HostRdy state this problem does not occur.
The position loop integral contribution trace variable always traces as zero.



**Changes/Fixes:**

90179	Unexpected commanded position values when using external profile mode, particularly with small negative velocities.  Trajectory position, velocity, and acceleration are computed internally to 48 bits, however only 32 bits are used for motor control or user-visible. This version uses more accurately rounded position values than previous versions.
90180	Commanded position incorrectly rounded when using a non-unity step to count ratio.

**Incompatibilities with previous version:**

Commanded positions produced by the external trajectory generator will be slightly different – in all cases they should be slightly more accurate than in previous versions.
Conversion of steps into actual position and vice versa will be slightly different – in all cases they should be slightly more accurate than in previous versions.

## Version 2.3:

**Incompatibilities with previous version: None (but see notes for Version 2.2)****Known Bugs:**

90181	Commanded position wrong when using a non-unity step to count ratio and a negative actual position.
90182	Non-unity step to count ratio sometimes not applied to actual position after a commanded change in the ratio.

**Known Issues:**

MC58x20 only: If the IO chip HostRdy signal (pin 8) is used for chip busy detection, the first instruction sent to the chipset after a device reset may be ignored or may produce a checksum error. It is recommended that in this configuration a NoOperation command be sent to the chipset as the first instruction after a power on or reset. If the <i>ReadStatus</i> operation is used to check the HostRdy state this problem does not occur.
The position loop integral contribution trace variable always traces as zero.

**Changes/Fixes:**

90178	In the previous release, for axes configured for brushed DC motors, setting the sample time to certain multiples of 51.2 can cause the PWM hardware to remain inactive.
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## Version 2.2:

**Incompatibilities with previous version:**

If the device is operated in dual encoder mode, the auxiliary axis encoder is now used for sinusoidal commutation. In previous releases, the main axis encoder was always used for sinusoidal commutation.

In dual encoder mode, configuration parameters pertaining to commutation, such as PhaseOffset, PhaseCounts, PhaseCorrectionMode, and SetSignalSense may require adjustment. These parameters are sent to the main axis, except for SetSignalSense, which is sent to the auxiliary encoder axis.

**Changes/Fixes:**

90169	In the previous release, if axes were disabled and then re-eneabled, commutation rates could sometimes deviate slightly from 10 kHz. In this 2.2 release, 10 kHz commutation rates are ensured.
90175	In prior releases, in dual loop sinusoidal commutation was performed using the main axis encoder. In this 2.2 release, in dual encoder mode sinusoidal commutation is performed using the auxiliary axis encoder.

## Version 2.1:

**Known Issues:**

MC58x20 only: If the IO chip HostRdy signal (pin 8) is used for chip busy detection, the first instruction sent to the chipset after a device reset may be ignored or may produce a checksum error. It is recommended that in this configuration a NoOperation command be sent to the chipset as the first instruction after a power on or reset. If the *ReadStatus* operation is used to check the HostRdy state this problem does not occur.

**Incompatibilities with previous version:**

If the CP bus is tied high (or left floating – which is the same) the default serial port baud was 9600 in 1.x and 2.0. It is now 57600.

**Known Bugs:**

90166	When the encoder source for P&D is set to loopback and the MotorOutput bit in the signal sense is active, the actual position goes in the opposite direction of the commanded position.
90168	MC58110 only: 3-phase PWMSign/Mag output mode not working correctly.

**Changes/Fixes:**

90167	When changing motor type from microstep 2-phase to pulse and direction the signal output becomes a high frequency square wave when profile is started and does not stop when profile is stopped. Fixed.
90170	Default serial port baud was 9600 instead of 57600 as documented for 2.0. Fixed.
90171	MultiUpdate was only affecting one axis. Fixed.

**Version 2.0:****Known Issues:**

If the IO chip HostRdy signal (pin 8) is used for chip busy detection, the first instruction sent to the chipset after a device reset may be ignored or may produce a checksum error. It is recommended that in this configuration a NoOperation command be sent to the chipset as the first instruction after a power on or reset. If the *ReadStatus* operation is used to check the HostRdy state this problem does not occur.

**Incompatibilities with previous version:**

AxisOut	In version 1.x of Magellan, when the axis out register is set to SignalStatus the output sense of AxisOut was inverted to indicate the active LOW sense of the signal status register. This has been maintained when the SetAxisOutSource command is used, but when the new API command SetAxisOutMask is used the user determines the sense of the output.
Default CAN configuration	If the CP bus is tied high (or left floating – which is the same) the default CAN configuration on Magellan 1.x was 500K, NodeID=0. For Magellan 2.x it is 20K, NodeID=0.
Motor phasing	For 2 or 3 phase motor commutation the phase angle for v2.0 is retarded by 90 degrees in comparison to v1.x. For example, setting the phase angle to 90 degrees in v2.0 is equivalent to setting the phase angle to 0 in version 1.x. The same is true for Set/GetPhaseOffset. This in no way affects motor wiring or hall connections between versions. This is for compatibility with ION.
Chip response to the reset command	For compatibility with ION and future products, when the reset command is executed it now does not send the “Processor reset” error code in the response. Instead, it responds “No error” and sets the InstructionError to “Processor reset”. Following the reset the host can execute GetInstructionError to verify that the chip reset correctly and also to clear the instruction error register.

**Known Bugs:**

None
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**Changes/Fixes:****Command Changes**

90165	Performing a SetMotorMode On with the motor type set to pulse and direction would cause the internal step position counter to be filled with an incorrect value. This problem would not result in any loss of steps or observable problems. Fixed.
90159	There was no output mode compatible with the AD1866. Fixed. SetOutputMode SPI_DAC_2s_Complement
90148	Following a successful hall-based phase initialization, GetCommutationMode did not return 0 (sinusoidal) even though that was the active commutation mode. Fixed.

**Communication Changes**

90163	When using parallel communication, a bad axis error would not be returned for invalid axis selection. Fixed.
90160	When using parallel communication, if a command is sent with an invalid axis value, if the host then attempts to read data it would receive data from the previous command. Fixed.
90155	In multi-drop serial mode the chip would not automatically re-sync each time it received the address byte of a new frame. Fixed.
90147	In CAN communication an invalid axis error code was returned in the high byte of the returned status word instead of in the low byte. Fixed.

**Trajectory Generation Changes**

90151	If the SetEncoderToStepRatio command was issued during a trapezoidal move with 1 count (or step) or less left to the destination position, the chip could stop responding. Fixed.
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**PWM/DAC Signal Output Changes**

90158	SPIEnable signal does not toggle after transmission of each data word. Fixed.
90153	SetSPIMode did not select the SPI data clocking scheme as documented. Fixed.

**Step Signal Output Changes**

	none
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**Servo Filter Changes**

90157	The biquad filter registers are not cleared when the motor mode is set to off. Fixed.
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**Commutation Changes**

	none
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**Registers and Signals Changes**

90162	The AxisOut1 or AxisOut2 signals could exhibit glitches. Fixed.
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#### Position Feedback Changes

90164	Selecting the parallel encoder as source does not store the first value read to the actual position. Fixed.
90152	MC58110 only. A position capture will store an incorrect value if encoder channel A has been inverted using SetSignalSense. Fixed.

#### Miscellaneous Changes

90149	Trace variable 29 (phase angle scaled) was stored as signed when it should have been unsigned. Fixed.
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